preferably includes a body **13**, which is preferably at least partially hollow and unitary. The body **13** in the **FIG. 1A** embodiment is a unitary structure that defines an x-axis extension **14** coincident with x-axis of the hinge, and a y-axis extension **16** coincident with a y-axis of the hinge. An x-axis subassembly, indicated generally at **18**, and a y-axis subassembly, indicated generally at **20**, are provided to engage the respective x-axis extension **14** and y-axis extension **16** and control rotation about the x-axis and the y-axis of device parts that are respectively engaged to the rotational components of the x-axis and y-axis sub assemblies **18** and **20**.

[**0038**] Basic x-axis and y-axis rotational movements can be appreciated with respect to **FIG. 2**, which shows an exemplary handheld device **22**, for example a personal digital assistant (PDA) or a cellular handset. The handheld device **22** includes a main part **24** and a flip part **26**. The flip part **26** may be opened by a user about the x-axis defined by the hinge **10**. The hinge **10** provides initial resistance to opening about the x-axis, being in a biased closed position, and then provides opening assistance about the x-axis once a predetermined angle of rotation about the x-axis is reached. Once the flip part **26** is in a position that permits rotation about the y-axis, i.e., a position where such rotation will not be physically interfered with by the main part **24**, the y-axis sub assembly **20** controls the rotation of the flip part **20**, providing some rotational resistance and feel, and also providing stop positions. In a preferred embodiment according to **FIG. 1A**, the hinge provides a bias position of 0° about the y-axis, and permits both negative and positive rotational movements about the y-axis, with positive and negative hard stops, preferably at +180° and −180° rotation about the y-axis.

[**0039**] With reference to **FIGS. 1A through 4**, the body **13** defines an axial bore **28** extending into the body **13**. An annular seat **30** is accommodated rotationally, for example, within a knuckle **31** of the main part **24** of the handset **22**. The x-axis extension **14** is sized and configured to engage a cam **32**. This engagement fixes the relative rotational position of the housing **13** and the cam **32** so that the cam may, along with a follower **34** control rotation of the hinge **10** about the x-axis.

[**0040**] In the preferred embodiment, the x-axis extension includes arcuate flanges **35** and flats **36** to slidingly engage guides **37** formed within the cam **32**. An end **38** of the x-axis extension **14** defines an annular groove **39** that mates with a locking clip **40** to hold the x-axis subassembly **18** together, as a spring **42** urges the cam **32** against the follower **34** held in place axially by the locking clip **40**. The follower **34** includes a hole **44** that rotates on arcuate surfaces **45** of an end of the x-axis extension **14**. When assembled, the locking clip **40** (along with a device part knuckle) will hold the follower **34** in abutment against the ends of the arcuate flanges **35** to fix the axial position of the follower **34**. A seat **46** of the cam **32** seats the spring **42**. Ridges **48** on the follower are contoured to ride along a cam surface **50** defined on the cam **32**. As artisans will appreciate, the shape and size of the ridges **48** and the depth and profile of the contours on the cam surface **50** may be designed to provide particular feel, the open and closed bias positions, as well as the points at which self-open and self-closed assistance may begin. The backside of the follower **34** defines a device interface **52** that locks into a knuckle **53** of the main part **24** to fix the relative rotational position of the main part **24** and the follower **34**. Additionally, the device interface **52** can radially bound the locking clip **40**.

[**0041**] The y-axis subassembly **20** is configured to control a predetermined range of rotation in both positive and negative directions. For example, the y-axis subassembly provide a bias positions at 0°, and provide positive and negative rotation with hard stops at 180° and −180°. With reference primarily to **FIGS. 1A and 4**, a seat **60** is defined by the body **13** at the base of the y-axis extension **16**. The seat **60** seats a stop collar **62**, which has a stop **64** that meets a stop **66** of the seat **60**. It is otherwise free to rotate on the seat **60**. The stop **64** and stop **66** can meet in either of the clockwise and counterclockwise rotational directions about the y-axis.

[**0042**] The extension preferably includes a bore **61**. A circuit pass through is defined, for example by a path through the bore **61** and the bore **28**. The stop **64** also engages a stop **72** of a rotating device interface **74**. The rotating device interface **74** seats on the stop collar **62** and includes a bore **78** to permit rotation about the y-axis extension **16**.

[**0043**] **FIG. 1B** is partial view the **FIG. 1A** hinge, illustrating cooperation of the stop features shown in **FIG. 1A**. The stop collar **62** will rotate with the rotating device interface **74** in either the clockwise or counterclockwise direction when the stops **64** and **72** are engaged, and the limit of rotation in either direction is defined by the stop **66** (which extends around to the backside of the view shown in **FIG. 1B**). With reference to **FIG. 1B**, the stop **64** is shown in a position against the stop **66** that resulted from the full clockwise rotation of the rotating device interface **74**. When the rotating device interface moved counter clockwise away from that position, the stop **64** likely remains in that position (though it is not harmful to device operation if it moves, due to friction, with the rotating device interface) until the counter clockwise rotation causes the stop **72** to engage the opposite side of the stop **64**. Once engaged, counterclockwise rotation is permitted until the stop **72** rotates the stop **64** into the other side of the stop **66**. The size and relative positions of the stops will determine the positive and negative rotation limits about the y-axis. In addition, **FIG. 1B** shows an additional seat **85** that serves to seat one end of the spring **42**.

[**0044**] The rotating device member **74** includes radial arms **88** shaped to engage a device part, e.g., the flip part **26**. In general, diametrically opposed pairs of radial arms are preferred, while a single rigid arm or other structure could be used to interface with a device part. Artisans will appreciate the additional rigidity and likely longevity provided by the preferred symmetrical and diametrically opposed radial arms **88**. This is also true of other pairs of structures in the preferred embodiments that could alternatively perform the same functions without pairs, as artisans will appreciate. A top surface **89** of the device member forms a seat for a leaf spring biasing member **90**, and a top surface **91** of the biasing member in turn forms a seat for a clip **92**.

[**0045**] An axial collar **102** and the seat **89** seat the leaf spring biasing member **90**, and the axial collar **102** also includes at least one and preferably two flats **104** to rotationally fix the clip **92** by engaging corresponding flats **105**. A top surface of each of the radial arms **88** includes